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Montana W. Banks

Philadelphia College of Osteopathic Medicine

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Does Light Therapy Improve the Quality of Life for People with Acne?

Montana W. Banks, PA-S

A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

In Partial Fulfillment of the Requirements For

The Degree of Master of Science

In

Health Sciences – Physician Assistant

Department of Physician Assistant Studies
Philadelphia College of Osteopathic Medicine
Philadelphia, Pennsylvania

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ABSTRACT

OBJECTIVE: The objective of this selective EBM review is to determine whether or not “Does light therapy improve the quality of life for people with acne?”

STUDY DESIGN: A systematic review of three peer-reviewed primary studies published between the years of 2016 and 2018. All articles were published in the English language and in peer-reviewed journals.

DATA SOURCES: One pilot study, one multicenter, randomized, split-face control study and one single-blind, randomized, split-face study evaluating if light therapy can improve the quality of life (QOL) of people with acne. Sources were selected from PubMed and Cochrane based off of the relevance to the clinical question and outcome being patient-oriented.

OUTCOME MEASURED: The outcome measured was the patient’s quality of life (QOL). This was measured in each trial by a questionnaire. These questionnaires include: Dermatological Life Quality Index (DLQI) self-assessment, Acne Quality of Life (QOL) Questionnaire, and Cardiff Acne Disability Index (CADI) self-assessment.

RESULTS: The study conducted by Antoniou et al.³ showed the comparison of CADI scores which indicated a decrease of 40% in the treatment hemifaces at six and 12 weeks that was significant. Also, the study by Grandi et al.⁵ showed significant improvement of DLQI over the entire treatment ($p < 0.01$). The study by Thuangtong et al.¹ showed significant improvement in QOL at weeks three ($p = 0.05$), five ($p = 0.03$) and last follow up visit ($p = 0.05$).

CONCLUSIONS: The evidence presented in this review suggests that light therapy can improve the quality of life for patients diagnosed with acne. All three studies had significant results (Antoniou et al.³, Grandi et al.⁵, and Thuangtong et al.¹). However, due to the limitations of these studies, such as small sample size, the concept of light therapy improving the quality of life for patients with acne warrants further research.

KEY WORDS: Quality of life, light or laser and acne.

INTRODUCTION

Acne vulgaris is a chronic inflammatory disorder of the pilosebaceous unit.¹ Acne is a common skin disease among teenagers and adults that can negatively affect self-esteem, perceived facial attractiveness, social participation, and other aspects of the patient's life. This condition is associated with significant psychosocial repercussions.¹ For these reasons, treatment of acne has been difficult for clinicians and patients due to compliance issues in maintaining the scheduled use of prescribed topical and oral medications.

Acne is a multifactorial inflammatory disease of the pilosebaceous duct, resulting in bacterial overgrowth and inflammation. Four pathophysiologic processes have been identified in contributing to the formation of lesions: 1) abnormal keratinocyte proliferation and desquamation; 2) androgen-driven increase in sebum production; 3) proliferation of *Propionibacterium acnes*; and 4) inflammatory mediators.² Acne is characterized by the presence of lesions most commonly on the face, neck, chest, or back. These lesions include noninflammatory open or closed comedones and inflammatory lesions characterized as papules, pustules, nodules, and cysts. In general, acne can be classified as mild, moderate or severe.²

Physician assistants frequently have the opportunity to treat acne in a variety of different settings. “Acne vulgaris is estimated to affect 9.4% of the global population, making it the eighth most prevalent disease in the world.”³ It is the most common skin disease affecting nearly all adolescents and up to 64% of young adults.³ Total direct costs for acne have been reported to exceed \$3 billion annually.² The number of dermatology visits is increasing each year, with more than 38 million dermatology visits in 2012.⁴

The treatment of acne will vary case to case, but standard first-line methods of treatment include topical medications such as retinoids, antibiotics, salicylic acid, azelaic acid, and

dapsone. Another option might be oral medications such as antibiotics, combined oral contraceptives, androgen agents, and isotretinoin. Other therapies also include chemical peels, extractions, and steroid injections.²

While there is some understanding of the pathophysiology and treatment of acne, there are still many unknown factors. Each patient can respond to an effective treatment regimen differently for unknown reasons. There is considerable variability in a patient's response to therapy for reasons unknown at this present time.² Researchers are still trying to fully understand the full spectrum of treatment and pathophysiology of acne.

As stated above, patients with acne can suffer from affected self-esteem, perceived facial attractiveness, and social participation that all can negatively affect their quality of life (QOL). The treatment methods mentioned above all play an effective role in the treatment of acne. However, as with all medications, each option will have a different effect on each patient. Light therapy is thought to have the potential to improve a patient's acne and therefore help improve their QOL. Overall, many patients that have acne will experience a reduction in their QOL if not treated effectively.

OBJECTIVE

The objective of this selective evidence based medicine (EBM) review is to determine whether or not "Does light therapy improve the quality of life for people with acne?"

METHODS

The three studies used in this systematic review include one pilot study, one multicenter, randomized, split-face control study, and one single-blind, randomized, split-face study. The studies evaluated if light therapy as in intervention can improve the QOL in patients who have acne by evaluating QOL using questionnaires. Populations in each study were males and females

with acne. These populations were compared to control groups or no control group in the pilot study.⁵ The outcome measured was disease-related QOL measured by the Cardiff Acne Disability Index (CADI) self-assessment,³ Dermatological Life Quality Index (DLQI) self-assessment,⁵ and Acne Quality of Life (QOL) Questionnaire.¹ Control groups included split face no treatment,⁵ split face salicylic acid 30% peel¹ or no control group.³ Inclusion criteria for this EBM review were any race or sex of participants with acne, outcomes that were patient orientated and research articles that were primary research studies. Exclusion criteria included articles published on dates greater than 10 years ago and outcomes that were not patient orientated.

The keywords “quality of life,” “light or laser,” and “acne” were used, and sources were selected from PubMed and Cochrane. Articles were selected based on their relevance to the clinical question and if the study included patient-oriented outcomes (POEMS). The articles were published between 2016 and 2018 and were published in the English language. The statistics reported included P-value, percent mean change from baseline, mean, median, and range. Table 1 shows the demographics and characteristics of the included studies.

OUTCOMES MEASURED

The outcome measured in each study was disease-related QOL which is a POEM and was measured by a questionnaire in each study. Grandi et al.⁵ had patients fill out a DLQI self-assessment to determine the impact of the light therapy on their disease-related QOL. Thuangtong et al.¹ had patients fill out an Acne QOL Questionnaire during each treatment visit. Antoniou et al.³ had each patient fill out a CADI self-assessment to determine the impact of the light therapy on the patient's disease-related QOL.

Table 1 - Demographics & Characteristics of included studies

Study	Type	# Pts	Age (years)	Inclusion criteria	Exclusion criteria	W/D	Interventions
Thuangtong ¹ (2017)	Single-blind, randomized, split-face study	12	18-36 years old	>= 18 years, any sex or race, Noninflammatory papules, some inflammatory papules, No topical acne medication for 1 month and/or oral retinoid for 1 year prior to the study	<18 years, pregnant	3	Pneumatic Broadband Light (PBBL) therapy within the spectrum range of 400 to 1200 nm, done to ½ of the patients face once weekly for a total of 6 treatments.
Antoniou ³ (2018)	Multicenter, randomized, split-face control study	104	16-30 years old	16-30 years old, hx of active acne vulgaris for at least 6 months, hx of moderate- severe acne, Fitzpatrick skin types I-IV	Active infection, any skin procedure in the last 6 months, pregnant, hormonal contraception, bleeding disorders, other facial dermatologic conditions, oral isotretinoin in the last 6 months	11	Chromophore gel-assisted blue light multi-LED phototherapy for 5 minutes at a 5 cm distance from the light source done biweekly for 6 weeks on ½ of the patients face.
Grandi ⁵ (2016)	Pilot Study	12	67-82 years old	Pts affected by multiple nonhyperkeratotic AK located on the face or scalp and >= 18 years old	Lesions with atypical appearance, other skin diseases, use of other products or treatments that interfere with study	5	Indole 3- Acetic Acid 0.015% in liposomal gel + green light photodynamic therapy at 520 nm wl for 15 minutes, once a week for four weeks.

RESULTS

This review assesses whether or not light therapy can help improve the QOL for patients diagnosed with acne. All three studies measured the disease-related QOL. Data from all three studies were continuous and could not be converted to dichotomous form.

The purpose of the study conducted by Grandi et al.⁵ was to examine the safety, efficacy, and tolerability of Photodynamic therapy (PDT) in the treatment of acne. This was a pilot study that recruited 12 patients with clinical diagnosis of multiple acne lesions grade one or two on the face or scalp. Median age was 77 years (67-82) with a high predominance of males (M: F = 11:1).⁵ Patients were included and excluded based on the criteria listed in table 1.

Each patient underwent four total applications, one per week, and were then evaluated at one month and three month follow up appointments. An experienced dermatologist evaluated the number of acne lesions in each treatment area at time zero, before each treatment and at each follow-up visit.⁵ Patients were withdrawn from the study and treated with standard therapies if at least a Partial Response (PR) was not reached at the one month follow up. "Partial Response (PR) has been evaluated as clinical regression in the number of acne lesions up to 50% of the baseline."⁵ There were five patients who did not reach a PR at their one month follow up and were excluded from the study. Values with significance less than ($p < 0.05$) were considered in this study.⁵

No patient compliance issues were noted in this study. Safety was evaluated by reporting adverse events, but no safety reports were made during this study.⁵ Tolerability was evaluated by performing a VAS score during each application. Overall, the therapy was well tolerated and all patients completed all four cycles of treatment. No significant differences in mean VAS scores were obtained. Overall mean VAS score was 0.3 ± 0.7 and comparing overall VAS score with

hypothetical VAS score of zero using one sample T-test led to no significant difference ($p=0.16$).⁵ Efficacy was evaluated by counting the number of lesions at time zero, every treatment session and at both follow-up visits. Overall, there was a statistically significant progressive reduction of a number of acne lesions from visit zero to one month follow up ($p<0.0001$).⁵

Disease-related QOL was evaluated by using the DLQI at time zero, before each application and at the one month follow up visit. Mean DLQI score was recorded at each visit.⁵ The DLQI was composed of 10 questions analyzing the patient's symptoms and feelings, daily activities, leisure, personal relationships, work, school and treatment.⁵ The total sum gives the burden of QOL impairment due to general dermatological disorders, with a maximum score of 30 being a significantly impaired QOL.⁵ Between the first and second visits, there was a significant reduction in mean DLQI score from 4.1 ± 5.1 to 1.8 ± 3.8 with a P-value of ($p<0.01$), but no further reductions were observed in following visits.⁵ Overall statistical analysis demonstrated a significant reduction in DLQI over the entire four cycles of treatment with a ($p<0.01$).⁵

Table 2. Mean DLQI Scores and P-values over time zero and one month follow up.

Study conducted by Grandi et al. ⁵	Mean DLQI Score	P-value	P-value over entire four cycles
First visit	4.1 ± 5.1	<0.01	<0.01
Before application 2	1.8 ± 3.8		
Before application 3	2.0 ± 4.7		
Before application 4	2.5 ± 5.6		
1 month follow up	2.3 ± 4.0		

The study conducted by Thuangtong et al.¹ compared the efficacy of salicylic acid 30% peel and pneumatic broadband light (PBBL) treatments in patients with mild to moderately severe facial acne vulgaris. The study included 12 patients aged 17 to 36 years old that were recruited for a total of 12 weeks with a 10:2 female to male ratio.¹ In the study one side of the

face was randomly assigned a treatment of salicylic acid 30% peel and the other side with PBBL for six consecutive weeks without other acne treatment.¹ Patients were treated one time a week for a total of six treatments and had two follow up visits at weeks three and six following the last treatment. In this study, a 2-tailed P-value of less than or equal to 0.5 was considered statistically significant.¹ Patients were included and excluded based on the criteria listed in table 1.

Improvement in the patient's acne was observed with the light therapy and was proven efficacious with minimal side effects and was well tolerated by all of the patients.¹ Safety of the treatment was evaluated by clinical inspection and the Wong-Baker FACES Pain Rating Scale (WBPRS) after each treatment. The WBPRS score for the salicylic acid 30% peel (range,0-0.5) and PBBL (range 1.0-1.5).¹ There were no unexpected reactions and no participants withdrew from the study due to adverse therapeutic advents. Most participants experienced only mild adverse reactions. One participant dropped out after the fourth treatment because of scheduling conflicts and two participants did not return for follow up.¹

At every visit, treatment evaluations were performed using the Acne Quality of Life Questionnaire to determine if treatment results affected participants socialization due to appearance. The questionnaire consisted of nine questions with four rating answers (0= not affected; 3=markedly affected). A total score of nine or higher indicated that acne had a substantial negative impact on the patient.¹ There was no significant difference found between the peeling agent or PBBL based on baseline QOL and subsequent visit assessments. However, the QOL assessments related to treatment satisfaction did yield significant differences between baseline and the end of treatment.¹ The differences were significant at weeks three ($p=0.05$), five ($p=0.03$) and last follow up visit ($p=0.05$).¹ According to the QOL scores, more participants were satisfied with the PBBL therapy by the third and fifth treatment session but only mild satisfaction

was reported at week four. This finding is most likely related to the immediate reduction of acne pustules by PBBL lysis of these lesions.¹

Table 3. QOL scores and p-values for the treatment period

Study conducted by Thuangtong et al. ¹	Salicylic Acid 30% Peel (range)		PBBL (range)		Difference	
	Median	p-value	Median	p-value	Median	p-value
Baseline	4.5 (0-13)	N/A	4 (0-13)	N/A	0	.15
1 week	4.5 (0-13)	.32	4 (0-13)	0	0	.27
2 week	1.5 (0-13)	.11	1.5 (0-11)	.08	0	.83
3 week	1.5 (0-11)	.05	1 (0-9)	.06	0	.05
4 week	2 (0-13)	.12	2.5 (0-13)	.15	0	.16
5 week	2 (0-12)	.11	0.5 (0-11)	.22	0	.03
6 week	2 (0-9)	.12	2 (0-9)	.41	0	.82
9 week (FU1)	2 (0-14)	.14	1.5 (0-14)	.42	0	.52
12 week (FU2)	3 (0-11)	.55	3 (0-15)	.63	0	.05

The study conducted by Antoniou et al.³ evaluated the safety and efficacy of Chromophore gel-assisted blue light multi-LED phototherapy in the treatment of moderate to severe acne vulgaris. The 12-week clinical trial involved 104 patients ages 16-30 years old. Patients were included and excluded based on the criteria listed in table 1. Eight total patients dropped out, five of which withdrew consent before the study started and three patients were not treated as the study enrollment period ended.³ Half of each patient's face was blindly and randomly selected to receive 6 weeks of the light treatment, while the other half of the face received no treatment. They were treated two times a week for six weeks and then had follow up appointments every two weeks for an additional six weeks.³

Efficacy was assessed by monitoring changes in the acne severity using the Investigator's Global Assessment (IGA) scale and inflammatory acne lesion counts. The study saw a reduction of at least two grades in the IGA scale, which was demonstrated in 51.5% of patients at week 12.³ Safety was assessed through a physical exam, vital signs, laboratory evaluations and physician and patient reporting of adverse events.³ Treatment was well tolerated by patients and

considered safe, with no serious adverse events reported and no patients dropping out of the study due to an adverse event.³

The impact acne had on the patients QOL was assessed with the CADI at baseline, week six and week twelve. The questionnaire is a total of five questions, with each question being scored on a scale from zero being no impact on QOL and four being a serious impact on QOL. This would result in a max score of 15. The higher the score, the more the impact acne has on the patients QOL.³ Total CADI scores and changes were compared between the treated and control hemiface of each patient. The comparison of CADI scores indicated a decrease of 40% in the treatment hemifaces at six and 12 weeks.³ Whereas, an increase of 20% was seen in the CADI scores of the control hemifaces at week six and twelve.³

Table 4. Percent mean change from baseline of CADI scores

Study conducted by Antoniou et al. ³	<u>Week 6</u> Percent Mean Change from Baseline	<u>Week 12</u> Percent Mean Change from Baseline
Treatment Hemiface	Decrease 40%	Decrease 40%
Untreated/Control Hemiface	Increase 20%	Increase 20%

Safety and Tolerability

As previously stated above in the results section, the light therapy was well tolerated in all three studies. There were no adverse events or serious injuries reported in any of the studies.

DISCUSSION

The objective of this EBM systematic review is to determine whether or not light therapy improves the quality of life of people with acne. Each study evaluated QOL using a questionnaire filled out by patients at various points in each study. In the study by Grandi et al.,⁵ mean QOL significantly improved between the first and second visits, but then no further improvement at following visits. The study by Thuangtong et al.¹ demonstrated significant

differences in improvement of QOL at weeks three, five and the last follow up visit. The study directed by Antoniou et al.³ demonstrated an improved QOL associated with the treated hemiface and a worsened QOL in the untreated/control hemiface. These significant findings bring promise in regards to future studies involving light therapy and acne.

Although there are a variety of light-based treatment devices that have been reported to be effective in the treatment of acne, we are lacking significant data on long-term efficacy, safety and long term effect on QOL.⁵ The availability of these devices for the treatment of acne are limited due to cost of the machines and technicians able to run and manage them.⁵ Light therapies in the treatment of acne have gained increasing interest over the years, due to limitations of traditional treatments. However, due to the lack of sufficient evidence of efficacy, safety and improvement of QOL, regulators are not encouraging light therapy to be strongly recommended according to official guidelines and consensus recommendations.³ Insurance providers still consider laser and light therapy for skin treatment a cosmetic procedure and will not cover it in the majority of cases.³ More traditional methods of treating acne, for example, topical creams and pills, are easily covered by insurance providers. This poses a large problem in the accessibility of this new treatment method.

Other limitations to light therapy include time consumptiveness of treatment and follow up treatments, cost, pain associated with treatment, and mild skin reactions. Some patients noted changes in their skin such as dryness, mild rash or erythema.¹ No contraindications were noted for the use of light therapy in any of the studies reviewed. Altogether, these negative factors decrease the feasibility and widespread use of light therapy as an acne treatment. If we are able to reduce these negative aspects, it would allow us to increase the number of patients treated with light therapy and potentially reduce the annual incidence of acne and improve patients QOL.⁵

This encouraging data, although it is coming from relatively small sample sizes and has its limitations, are part of the steps to plan and perform larger studies in the future.⁵

Some limitations to the studies themselves include small sample sizes. Two of the studies included in this EMB review had extremely small sample sizes and therefore could be difficult to make large-scale predictions on the data due to the small sample of the population. Another limitation to this data is all three studies used a different questionnaire to assess the patients QOL and implemented different forms of light therapy. This makes it difficult to compare the data and draw conclusions. In the studies by Thuangtong et al.¹ and Antoniou et al.³ patients, clinicians, and study workers were not kept blind to the treatment. This could pose a problem in data collection. Patients were responsible for reporting their perceived QOL in the various questionnaires which could have been influenced by knowing the treatment and the location of the treatment on their face. Race and sex could also be limiting factors in these studies. The light therapy may have responded differently to people based on varying shades of skin color or sex.

CONCLUSIONS

The results of all three studies indicated that light therapy does improve the QOL of patients with acne. Significant improvement in the patients QOL from baseline with the use of light therapy was demonstrated. However, due to the limitations of these studies, further research needs to be done to provide additional information and regulations. It is imperative that future studies use more diverse and larger sample sizes while also including blinding in their methods. Further study is warranted to evaluate treating acne on varying skin tones with light therapy. Due to an increasing number of people diagnosed with acne each year, it is important to consider light therapy as an alternative acne treatment option for those who need it. Medical professionals need to continue expanding their knowledge of light therapy options for people diagnosed with acne.

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